

### **REMARKS/ARGUMENT**

The Examiner is thanked for the careful review of this application. Claims 1, 3, 5, 7-13, 15-23, and 26-27 are pending in the present application after entry of this Amendment. No claim amendments are submitted, and no new matter is introduced.

#### **Rejections under 35 USC §102**

Claims 1-27 were rejected under 35 USC §102(e) as being anticipated by Chilimbi et al. (U.S. Patent No. 6,330,556). Applicant traverses this rejection and requests reconsideration.

In order for a reference to anticipate a claim, each and every element as set forth in the claim must be found in the reference, either expressly or inherently described. MPEP 2131. Applicant respectfully submits that Chilimbi et al. do not anticipate Applicant's claims 1, 3, 5, 7-13, 15-23, and 26-27.

In independent claim 1, Applicant claims a method of information structuring in a data set containing a plurality of interrelated objects. The method includes ranking related objects based upon relationship strength. The ranking includes, for each related object to a selected object, calculating an affinity value between each of the related objects and the selected object based upon one or more criteria, and ordering each of the related objects in the data set according to the affinity value between the related object and the selected object. The method further includes clustering related objects, and computing a number of affinity charts per object. The one or more criteria includes a subjective measurement.

According to the Office, "Ranking related objects based upon relationship strength (reordering takes place wherein edges between data elements in different data structures are not even put in the model for building the affinity graph-column 7 and field layout is optimized for inherent locality by placing fields that show strong affinity close to each other using a greedy algorithm to produce structure field order recommendations from a structure field affinity graph-column 8 in the sense that re-ordering takes place for the layout..." Applicant would very much like to respond with reasoned argument, but the above rejection makes no sense as presented to Applicant. Applicant respectfully requests that the Office clarify and punctuate the rejection to present a cogent argument and valid basis for rejection to which the Applicant might reasonably be expected to reply.

Applicant, desiring to proceed towards allowance of the present application, respectfully submits that the patent to Chilimbi et al. does not anticipate Applicant's independent claim 1 for at least the following reasons. Applicant claims *ranking related objects based on relationship strength, the ranking including for each related object to a selected object*. This is *not* what the Chilimbi et al. reference teaches. According to Chilimbi et al., "an operation by an application on one field will contemporaneously or immediately be followed by an operation on another field. ... This results in a high temporal access affinity for those two elements." (col. 6, lines 17-24) Further, "A field affinity graph is constructed... The edges are weighted to indicate field affinity, *which is a function of temporal information and execution frequency* with each structure access point as derived from the trace file." (col. 6, lines 58-65, emphasis supplied) Chilimbi et al., then, is not teaching the ranking of related objects based on relationship strength, but rather the frequency of contemporaneous access to classes of objects.

Further, Applicant claims the ranking for *each related object to a selected object*. Figure 3 of the Chilimbi et al. reference, cited by the Office, but for indiscernible purpose, illustrates nodes or fields. "The nodes are representative of all instances of the data structure." (col. 6, lines 61-62) Therefore, each node or field does not represent each related object or a selected object. The Chilimbi et al. reference does go on to describe that "to construct the field affinity graph, each structure instance is used to construct an instance field affinity graph" (col. 7, lines 8-9). Even if this could be stretched to capture the "each related object" claimed by Applicant, this cannot also then teach ranking each related object to a selected object.

Applicant also claims *ordering each of the related objects in the data set according to the affinity value between the related object and the selected object*. Chilimbi et al., on the other hand, teach generating a "weighted affinity graph" with affinity graph being defined to represent high temporal access, "where edge weights are proportional to the frequency of contemporaneous access" (col. 7, lines 50-55). Again, Chilimbi et al. does not teach ordering of each related object in the data set according to the affinity value between the related object and the selected object. Looking at an objective of the Chilimbi et al. reference, to improve the efficiency of cache line access (abstract), this makes sense. Chilimbi et al. is not teaching a strength of relationships between individual related objects, but the organizing of

classes of objects so that those accessed contemporaneously are grouped together in cache for most efficient cache utilization.

Yet another feature Applicant claims that the Chilimbi et al. reference does not teach is the calculating of an affinity value between each of the related objects and the selected object based upon one or more criteria, wherein the one or more criteria includes a subjective measurement. As discussed above, Chilimbi et al. do not teach calculating an affinity value between *each of the related objects* and the *selected object*. Further, Chilimbi et al. do not teach the one or more criteria including a subjective measurement. Applicant understands the Office to support the rejection of the subjective criteria feature by stating that “Metrics have been used to evaluate structure field orders wherein the re-ordering takes place by the greedy algorithm taking into consideration of the subjective measurement such as the metadata created by the programmer wherein the re-ordering accounts for the field constraints defined by the metadata.” The Office then vaguely cites Figures 2-3, 5, and 7, and columns 6-10. Unfortunately, it appears that it is the Office that has attributed “subjective measurement” to the metadata described by Chilimbi et al., and not the reference itself. According to Chilimbi et al., “metadata identifies constraints such as those related to elements being passed outside the program, those having pointers to them or references to them” (col. 9, lines 44-47). Although the Office may have attributed subjective measurement to metadata, Chilimbi et al. **does not** teach subjective measurement. It is **the reference** that must teach each and every element as claimed by Applicant, not the Office.

For at least the above reasons, Chilimbi et al. do not teach each and every element as set forth in Applicant’s independent claim 1. Applicant therefore requests that the rejection of claim 1 under 35 USC §102 be withdrawn. Likewise, Applicant’s claim 3 which depends from claim 1 is also patentable under 35 USC §102 and not anticipated by the patent to Chilimbi et al. Applicant therefore requests that the rejection of claims 1 and 3 be withdrawn.

In independent claim 5, Applicant claims a method of generating a graphical layout. The method includes selecting a principal node for the graphical layout, and generating at least one affinity chart in connection with the principal node. The at least one affinity chart is comprised of an affinity curve. The method further includes sequentially establishing related items along the at least one affinity chart by rank.

According to the Office, the reference teaches Applicant's independent claim 5 as supported by Figures 2-3, 5, and 7 of the Chilimbi et al. reference, and columns 6-10. Unfortunately, the Office fails to identify what in the cited figures teaches various elements, or any specific reference in the volume of cited text. For example, Applicant does not here address whether or not Chilimbi et al. actually teach generating a graphical layout, but Applicant does claim a method for generating a graphical layout which includes selecting a principal node. The Office supports the rejection by asserting "such as the node a." Applicant respectfully points out that, under 35 USC §102, it is *the reference* that must teach each and every element as set forth in Applicant's claim, and not the Office. Although the Office has arbitrarily selected "node a" to be a principal node (and, node a of Figure 3, so the Applicant assumes), Applicant respectfully requests citation to the reference that supports node a, or any other node, is a principal node.

Applicant respectfully submits that Chilimbi et al. do not teach the selection of a principal node. As discussed above in reference to claim 1, Chilimbi et al. do not teach, for each related object to a selected object, calculating an affinity value between each of the related objects and the selected object, and therefore no one object is evaluated compared related objects such that the one object can be illustrated as a principal node. Nothing in the description of Figure 3 in Chilimbi et al. teaches or suggests that node a, or any other node, is a principal node, and nothing in columns 6-10 teach or suggest the selection of a principal node.

Applicant claims that the at least one affinity chart comprises an affinity curve. The Office supports the rejection by a vague reference to Figures 2-3, 5, and 7. Figure 2 is pseudo code for a program written in a language such as C which includes individually addressable data elements (col. 6, lines 3-5). Figure 3 is a field affinity graph (col. 6, line 58). Figure 5 illustrates the process of computing the increase in configuration locality from adding field *x* to an existing layout (col. 8, lines 32-34). Figure 7 is a block representation of the resulting recommended layout of two cache blocks that relate to the simplified data structure A defined in Figure 2 (col. 10, lines 15-17). The Chilimbi et al. does not teach an affinity curve.

Applicant claims sequentially establishing related items along the at least one affinity chart by rank. Although the Office recites that metrics are used to evaluate structure field orders, re-ordering by greedy algorithm, and metadata, this does not

support that Chilimbi et al. teaches anything about establishing items along an affinity chart, the affinity chart being an affinity curve, by rank.

For at least the above reasons, Applicant submits that the Chilimbi et al. reference does not teach each and every element as claimed in Applicant's independent claim 5, and therefore does not anticipate Applicant's independent claim 5. Applicant's claims 7-13 each depend, directly or indirectly from independent claim 5, and the patent to Chilimbi et al. therefore does not teach each and every element as claimed in Applicant's dependent claims 7-13 for at least the same reasons. Applicant requests that this rejection be withdrawn.

In independent claim 15, Applicant claims a method for providing graphical visualization of items from data sets. The method includes determining, for a plurality of items from the data set, a set of properties. The set of properties includes a relationship to each other of the subsets of items in the data set, and a value applied to the relationships between the items. The method further includes applying local rankings of the relationships between terms. The applying is accomplished by ranking items  $i$  that relate to each item  $j$ , and ranking all items  $k$  to which item  $j$  relates, thereby ranking the affinity of each item  $j$  to item sets  $i$  and  $k$ . The method then includes generating a graphical visualization by presenting results separately for each item in a data set and adjusting the presentation to avoid information overlap and overload. The method further includes providing separate presentation for each item of the data set by generating an affinity chart for each item  $j$  in the data set. The presentation thereby displays items closely related to selected item  $j$ , with item  $j$  placed prominently in the affinity chart, and placing items which are more strongly related to  $j$  closer to  $j$ .

According to the Office, Applicant's independent claim 15 encompasses the same scope of invention as that of claims 1, 8, and 13. Applicant respectfully disagrees. Specifically, claims none of claims 1, 8, or 13 recite such features as determining, for a plurality of items from the data set, a set of properties. Claims 1, 8, and 13 also do not recite that the set of properties includes a relationship to each other of the subsets of items in the data set, and a value applied to the relationships between the items. Claims 1, 8, and 13 also do not recite applying local rankings of the relationships between terms in which the applying is accomplished by ranking items  $i$  that relate to each item  $j$ , and ranking all items  $k$  to which item  $j$  relates, thereby

ranking the affinity of each item *j* to item sets *i* and *k*. Further, claims 1, 8, and 13 do not recite generating a graphical visualization by presenting results separately for each item in a data set and adjusting the presentation to avoid information overlap and overload.

Applicant has addressed claims 1, 8, and 13 above. However, Applicant further points out that the Chilimbi et al. reference does not teach or suggest generating a graphical visualization of items from data sets as claimed by Applicant. Chilimbi et al. do teach providing “one of many graphical representations such as that shown in Figure 7” (col. 10, lines 29-31). Figure 7, as discussed above, illustrates a block representation of the *resulting recommended layout of two cache blocks* that relate to the simplified data structure A defined in Figure 2 (col. 10, lines 15-17). Applicant is not claiming a layout of a cache block.

For at least the above reasons, the patent to Chilimbi et al. does not teach each and every element as claimed in Applicant’s independent claim 15. Claim 15 is therefore patentable under 35 USC §102(e) over the patent to Chilimbi et al., and Applicant requests that the §102 rejection be withdrawn. Likewise, claims 16-18 depend directly or indirectly from independent claim 15, and are therefore patentable for at least the same reasons. Applicant requests that these rejections be similarly withdrawn.

In independent claim 19, Applicant similarly claims the graphic visualization of data sets. The Office has rejected the claim, stating that claim 19 encompasses the same scope of invention as that of claims 1, 5, 7-8, 11, 13, and 15. As described above, Chilimbi et al., at least, fail to teach graphic visualization of data sets. For at least the reasons stated above in reference to the rejection of claims 1, 5, and 15, Applicant submits that the patent to Chilimbi et al. fails to teach each and every element as claimed in Applicant’s claim 19, and requests that the §102 rejection of this claim be withdrawn.

Independent claim 20 recites a method for providing visualization of arbitrarily large data sets using low and local computational resources. The method includes determining, for at least a plurality of said data sets, a set of properties, said set of properties including a relationship to each other of the subsets of items in the data set, and a value applied to the relationships between the items. Then, at least one primary item is determined for the visualization. The method then includes applying

local rankings of the relationships between terms, by ranking a first relational set of items that relate to the primary item, and ranking a second relational set of items to which the primary item relates, thereby ranking an affinity to each primary item to the first relations set of items and to the second relational set of items. A visualization is generated by presenting results separately for each item in a predetermined data set and adjusting the presentation to avoid information overlap and overload. The method then includes providing separate presentation for each item of the data set by generating an affinity chart for each primary item in the data set, thereby displaying items closely related to a selected primary item, with the primary item placed prominently in the affinity chart, and placing items which are more strongly related to the primary items closer to the primary item. The method includes expressing closeness along curves or shaped segments, connected or emanating from the primary item's position. The expression of closeness includes completely or partially straight shaped segments. Continuous curves including spiral segments are employed in order to connect items relating to a primary item at different intensity levels. The method further includes adjusting the visualization to avoid information overlap and overload. The items related to the primary item are grouped by strength of affinity. Further provided is providing an affinity chart, and spacing each related item individually with each item placed in a non-overlapping position, and presenting items with large numbers of related items with multiple affinity charts, and in the case of multiple affinity charts, providing a first affinity chart to visually represent a set of most strongly related items and providing next or subsequent related affinity charts to visually represent less strongly related items. The method further provides for using curves to represent a relationship of items related to a particular item positioned at a starting point for the curve, with distance along the curve representing a strength of an affinity to the item at the starting point of the curve. Finally, the method includes selectively employing color and shading gradations and curve thickness gradations are to emphasize the curve's role in conveying affinity strength, while placing items so they do not overlap or crowd each other.

Although the Office rejects claim 20 with the simple recitation that it encompasses the same scope of invention as that of claims 15, and 18, Applicant further points out that, "coloring" as used by Chilimbi et al. does not teach "coloring" as used by Applicant. Chilimbi et al. specifically defines that "coloring segregates

heavily and infrequently accessed elements in non-conflicting cache regions” (col. 13, lines 9-10). Because Chilimbi et al. does not teach the generation of visualizations of data sets, Chilimbi et al. does not teach tint or hue, shading, intensity, saturation, continuous curves, spiral segments, etc. Applicant, in reciting the generating of visualizations of data sets, recites coloring as used in Applicant’s specification as filed. Applicant recites coloring to more clearly define and illustrate a visualization. Applicant has not recited and has not described “coloring” as related to segregating heavily and infrequently accessed elements in non-conflicting cache regions.

Applicant further points out that Chilimbi et al. teach nothing of providing visualization of arbitrarily large data sets *using low and local computational resources*. While Chilimbi et al. is directed to maximizing efficient use of cache, expenditure of computational resources is simply not addressed in the reference. Chilimbi et al. simply do not teach each and every element as recited in Applicant’s claim 20, and Applicant requests that this rejection be withdrawn.

Applicant’s independent claim 21 recites a method for providing visualization of large interrelated data sets. The method includes determining a relationship strength of related items in a data set. For each item in the data set, the method includes ranking related items based on the relationship strength and clustering related items based on the ranking. The method then includes computing a number of affinity charts per item, and establishing clusters of related items. The steps of ranking related items based on the relationship strength and computing the affinity charts are repeated until a desired information structure is achieved. The method then provides for positioning a principal node prominently in the affinity chart, and generating entries in the affinity chart emanating from the principal node for each of said clusters of related items.

For at least all of the reasons set forth above, Applicant submits that the Chilimbi et al. reference fails to anticipate Applicant’s independent claim 21. Dependent claims 22-23, depending directly or indirectly from independent claim 21, are patentable for at least the same reasons.

In independent claim 26, Applicant claims a computer readable medium containing computer program instructions for providing visualization of items from data sets. The computer program instructions contain instructions for determining, for at least a plurality of said data sets, a set of properties, said set of properties including

a relationship to each other of the subsets of items in the data set, and a value applied to the relationships between the items. Further instructions include applying local linkings of relationships between terms, by ranking items *i* that relate to each item *j*, and ranking all items *k* to which *j* relates, thereby ranking the affinity to each item *j* to item sets *i* and *k*. Then, the instructions provide for generating a visualization by presenting results separately for each item in a predetermined data set and adjusting the presentation to avoid information overlap and overload. And finally, instructions are included for providing separate presentation for each item of the data set by generating an affinity chart for each item *j* in the data set, thereby displaying items closely related to selected item *j*, with item *j* placed prominently in the affinity chart, and placing items with are more strongly related to *j* closer to *j*.

For at least all of the reasons set forth above, Applicant submits that the Chilimbi et al. reference fails to anticipate Applicant's independent claim 26. Applicant further notes that the act of describing "computer readable medium" as might be used to access cache, is not the same as teaching computer readable medium to implement the principles of the invention of Chilimbi et al. Chilimbi et al. do not teach a computer readable medium to improve the efficiency of cache line access, and do not teach computer readable medium for providing visualization of items from data sets as claimed by Applicant in claim 26. Applicant requests that this rejection be withdrawn.

Similarly, Applicant's independent claim 27 recites a system for providing visualization of items from data sets at a first computer operably coupled to a second computer over a communications network. The system includes a computerized server associated with said second computer. The computerized server includes data set visualization software executable on said computerized server and configured to determine, for a plurality of said data sets, a set of properties, said set of properties including a relationship to each other of the subsets of items in the data set, and a value applied to the relationships between the items. Further, the server is configured to apply local rankings of the relationships between terms, by ranking items *i* that relate to each item *j*, and ranking all items *k* to which item *j* relates, thereby ranking the affinity of each item *j* to item sets *i* and *k*, and to generate a visualization by presenting results separately for each item in a data set and adjusting the presentation to avoid information overlap and overload. Finally the server is configured to provide


a separate presentation for each item of the data set by generating an affinity chart for each item *j* in the data set, thereby displaying items closely related to selected item *j*, with item *j* placed prominently in the affinity chart, and placing items which are more strongly related to *j* closer to *j*.

For at least all of the reasons set forth above, Applicant submits that the Chilimbi et al. reference fails to anticipate Applicant's independent claim 27. Applicant requests that this rejection be withdrawn.

Applicant acknowledges that the patent to Chilimbi et al. uses many of the same terms as Applicant, but Applicant's claims must be read in light of the specification supporting them. Applicant is not suggesting that additional meaning or matter be read into the claims, but it might be helpful to first consider the objectives of both Applicant's claimed invention and any cited reference to determine a context in which similar terms, with very different meanings, might be used. In the present rejection, a 35 USC §102 rejection requires that each and every element *as set forth in the claim* must be found in the reference. This is a difficult standard to meet when words having the same spelling but very different meanings are found in both Applicant's claimed invention and the reference.

In view of the foregoing, Applicant respectfully requests reconsideration of claims 1, 3, 5, 7-13, 15-23, and 26-27. Applicants submit that all claims are in condition for allowance. Accordingly, a notice of allowance is respectfully requested. If Examiner has any questions concerning the present Amendment, the Examiner is kindly requested to contact the undersigned at (408) 749-6900, ext. 6905. If any additional fees are due in connection with filing this amendment, the Commissioner is also authorized to charge Deposit Account No. 50-0805 (Order No. ROXIP277). A copy of the transmittal is enclosed for this purpose.

Respectfully submitted,  
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